

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-193494

(43)Date of publication of application : 28.07.1998

(51)Int.Cl.

B32B 7/02  
B05D 5/00  
B32B 15/08  
B32B 27/20  
B32B 27/36  
C23C 14/20

(21)Application number : 09-019686

(71)Applicant : OIKE IND CO LTD

(22)Date of filing : 16.01.1997

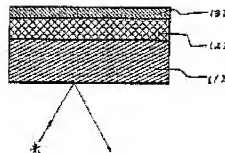
(72)Inventor : KUWAKI KATSUHIRO

## (54) DIFFUSION REFLECTING FILM

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To improve undirectivity of paper whiteness by forming a metal deposition layer at an opposite side of a reflection using surface of a plastic film base material containing white pigment and specifying total ray permeability, and forming a corrosion inhibiting layer on the deposition layer, thereby enhancing diffusion reflectivity.

**SOLUTION:** The diffusion reflecting film comprises metal deposition layers 2 formed on a reflection using surface and its opposite surface of a base material 1 and corrosion inhibiting layers 3 on the layers 2. As the material 1, a plastic film containing white pigment and having total ray permeability of 50% or less is used. The layer 2 is formed by a film forming method such as a vacuum deposition method, sputtering method or ion plating method. As the layer 2, sole silver, alloy of the silver and other metal, or laminate of silver and other metal is preferable. As the layer 3, paint made of thermoplastic resin, thermosetting resin, electron beam curable resin or ultraviolet curable resin is used.



## \* NOTICES \*

JP0 and INPIT are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**CLAIMS**

---

[Claim(s)]

[Claim 1] A diffuse reflection film having contained a white pigment, and total light transmittance's having formed a metal deposition layer (2) in an opposite hand of a reflective use side of 50% or less of plastic film base material (1), and forming a corrosion prevention layer (3) on this metal deposition layer (2) further.

[Claim 2] A plastic film base material (1) containing a white pigment Titanium oxide, Barium sulfate, magnesium sulfate, silicon oxide, magnesium carbonate, The diffuse reflection film according to claim 1 which is what scours a white pigment more than calcium carbonate and a \*\*\*\*\* kind to a plastic, and contains it in a film, or is contained with a gestalt which holds in a film surface by coating, or is provided with both above both.

[Claim 3] The diffuse reflection film according to claim 1 whose metal deposition layer (2) is a thing more than a kind chosen from a layered product of an alloy of silver independence, silver, and other metal, silver, and other metal.

---

[Translation done.]

## \* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

## DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[Field of the Invention]About the diffuse reflection film for liquid crystal displays, in more detail, diffuse reflectance of this invention is high, and it relates to the diffuse reflection film for liquid crystal displays of the paper white color excellent in indirectivity. The diffuse reflection film of this invention is suitable for using it for reflective liquid crystal display conventional type [, such as a STN type and a TFT type, ], polarizing plate loess type reflective liquid crystal display, etc.

[0002]

[Description of the Prior Art]As a reflection film, conventionally A white pigment kneading lump polyethylene terephthalate film, What vapor-deposited aluminum and silver, a silver deposition film, a vacuum-plating-of-aluminium film, alm NIUMU foil, the alm NIUMU board, the stainless plate, etc. are used on the mat-ized polyethylene terephthalate film.

[0003]

[Problem(s) to be Solved by the Invention]However, in the case of this conventional white pigment kneading lump polyethylene terephthalate film, there is a fault that diffuse reflectance is low and paper white nature also has it. [ bad ] As for \*\*-par white nature, the thing which needs this whiteness degree is because [ that a whiteness degree is / the contrast of the display screen of a liquid crystal / high ] it is moderate and a screen becomes legible for liquid crystal displays on the basis of the whiteness degree of the barium sulfate currently used for the standard white plate. Since what vapor-deposited aluminum and silver on the mat-ized polyethylene terephthalate film (a vacuum evaporation side is used making it into a reflector), alm NIUMU foil, an alm NIUMU board, a stainless plate, etc. become a metal tone, they have directivity, and it has a fault, like paper white nature is also bad.

[0004]

[Means for Solving the Problem]This invention solves a technical problem which the aforementioned conventional article has. Namely, contain a white pigment and total light transmittance forms a metal deposition layer (2) in an opposite hand of a reflective use side of 50% or less of plastic film base material (1). It is a diffuse reflection film forming a corrosion prevention layer (3) on this metal deposition layer (2) furthermore, A plastic film base material (1) containing a white pigment Titanium oxide, Barium sulfate, magnesium sulfate, silicon oxide, magnesium carbonate, . [ whether a white pigment more than calcium carbonate and a \*\*\*\*\* kind is scoured to a plastic, and is contained in a film, and ] . It is what is

contained with a gestalt which holds in a film surface by coating, or is provided with both above both. It is the aforementioned diffuse reflection film, and a metal deposition layer (2) is the aforementioned diffuse reflection film which is a thing more than a kind chosen from a layered product of an alloy of silver independence, silver, and other metal, silver, and other metal.

[0004]When a white pigment is contained and total light transmittance vapor-deposits silver to an opposite hand of a reflective use side of 50% or less of plastic film base material, while concealment nature is given, silver serves as a high reflecting layer and diffuse reflectance becomes high, a paper white color is emphasized further. The multiple echo of the light reflected by a silver deposition layer is carried out by a white pigment, and it becomes diffusibility with light with little surprising directivity. Furthermore, since it is easy to corrode, a silver deposition layer provides a corrosion prevention layer, gives endurance, it cancels all problems that the conventional diffuse reflection film was holding, and serves as a usable diffuse reflection film.

[0005]

[Embodiment of the Invention]Based on the composition (drawing 1) of the diffuse reflection film of this invention, it explains in detail. It can be used if it is a plastic film which will contain a white pigment and in which total light transmittance will be 50% or less as a substrate (1) adopted as the diffuse reflection film of this invention. In order to improve performance, added white plastic films, such as an ultraviolet ray absorbent, a white agent, and a spray for preventing static electricity, can also be used. Although total light transmittance is a range with preferred 50% or less, the minimum in particular that is 15% or less still more preferably is not limited 20% or less more preferably. As base resin of a plastic film, although there is no restriction in particular, an acrylic film, a polycarbonate film, a polyarylate film, a polyethylene terephthalate film, a polyethylenenaphthalate film, a fluorine film, etc. are preferred.

[0006]As a white pigment included in a substrate (1), white pigments, such as titanium oxide, barium sulfate, magnesium sulfate, silicon oxide, magnesium carbonate, and calcium carbonate, are preferred. Although there is no restriction in particular about particle diameter, 50 micrometers or less are preferred. when particle diameter is larger than 50 micrometers, it is \*\*\*\*\* in a plastic film -- since it becomes an obstacle when coating the surface of \*\* and a plastic film, it is not desirable. a white pigment is \*\*\*\*\* in a plastic film -- the surface of \*\* and a plastic film is coated, or although it is \*\*\*\*\* , it is further coated upwards by the plastic film. The addition has a preferred addition from which total light transmittance will be 50% or less. Since metallic luster will come out and directivity and a paper white color will become weak if total light transmittance is not less than 50%, it is not desirable. As for these substrates (1), what carried out film shaping of the plastic containing the aforementioned white pigment is more preferred, and they make this plastic contain air bubbles and other polymer further, and make lightweight nature, the further improvement in a whiteness degree, etc. realize.

[0007>About the thickness of a substrate (1), although there is no restriction in particular, the range which is usually 12-300 micrometers is preferred. If thickness runs short of intensity in less than 12 micrometers, and is inferior to workability and thickness exceeds 300 micrometers on the other hand undesirably, intensity is too strong, and cost goes up it is not only inferior to workability, but, and it is not economical, and practical.

[0008]The metal deposition layer (2) adopted as the diffuse reflection film of this invention is formed by the film production methods, such as a vacuum deposition method, sputtering process, and the ion plating

method, and its layered product of the alloy of silver independence, silver, and other metal, and silver and other metal is preferred as a metal deposition layer. The thickness of a metal deposition layer (2) is suitably chosen from the range which are usually 10 nm - about 200 nm, although there is no restriction in particular. Even if a reflection effect is not accepted in less than 10 nm but thickness exceeds 200 nm on the other hand, since the further improvement in a reflection effect not only shows the tendency not to accept, but for the internal stress of a metal deposition layer to increase, and for adhesion strength with a substrate to fall, but its amount of silver [ used ] increases, it is economically inferior and it is not preferred. [0009]As a corrosion prevention layer (3) adopted as the diffuse reflection film of this invention, although there is no restriction in particular, the paints, ultraviolet curing nature thermoplastics, thermosetting resin, electron beam hardening resin, or resin etc., are used, for example. For example, an amino resin, an amino alkyd resin, acrylic resin, Styrene resin, an acrylic styrene copolymer, urea-melamine system resin, These plastic paint that is independent or consists of mixtures, such as epoxy system resin, fluororesin, polycarbonate, NITORU cellulose, cellulose acetate, an alkyd resin, polyester resin, and polyamide system resin, is used. Said corrosion prevention layer (3) the paint which diluted said corrosion prevention layer resin with the solvent all over the metal deposition layer (2) side of the substrate in which the aforementioned metal deposition layer (2) was formed The gravure coating method, It applies and dries with the usual coating methods, such as the roll coating method and a dip coating method (in the case of hardening resin, it hardens), and is formed. The thickness of a corrosion prevention layer (3) is suitably chosen from the range which is usually about 0.5-5micro, although there is no restriction in particular. The surface of said substrate and a metal deposition layer cannot be uniformly covered with less than 0.5 micrometer in thickness, The effect in which the corrosion prevention layer was formed cannot fully demonstrate, but there is no value in which the corrosion prevention layer was formed, even if it exceeds 5 micrometers on the other hand, there is no big difference in the effect of a corrosion prevention layer, the drying rate of a corrosion prevention layer becomes slow, and since it is inefficient, it is not desirable. [0010]By the diffuse reflection film obtained in this way forming a metal deposition layer (2) in the reflective use side and opposite side of a substrate (1), and also forming a corrosion prevention layer (3) on a metal deposition layer (2), Diffuse reflectance becomes the thing of a paper white color which was highly excellent in indirectivity, and is used for the diffuse reflection film for liquid crystal displays, etc. Although an example is raised to below and a diffuse reflection film is explained to it in detail, it is not restricted to this.

[0011]

[Example]

\* a polyethylene terephthalate film (the Toray Industries make.) with a thickness of 100 micrometers which scoured \* example 1 silicon oxide and made lump total light transmittance 46% Trade name: The 80-nm-thick metal deposition layer was formed in the opposite hand of the reflective use side of the lumiler X-42 for silver with vacuum deposition, after that, complete spreading desiccation of the melamine epoxy resin coating was carried out, the 1.5-micrometer-thick corrosion prevention layer was formed on it, and the diffuse reflection film of this invention was obtained.

\* a polyethylene terephthalate film (the Teijin make.) with a thickness of 50 micrometers which scoured \* example titanium dioxide and made lump total light transmittance 23% Trade name: The 80-nm-thick metal deposition layer was formed in the opposite hand of the reflective use side of the Teijin Tetron film U2 for silver in sputtering, after that, complete spreading desiccation of the acrylic resin was carried out, the 1.5-

micrometer-thick corrosion prevention layer was formed on it, and the diffuse reflection film of this invention was obtained.

[0012]\* a polyethylene terephthalate film (the product made from diamond foil.) with a thickness of 38 micrometers which scoured \* example 3 titanium oxide and made lump total light transmittance 14% Trade name: The 80-nm-thick metal deposition layer was formed in the opposite hand of the reflective use side of the diamond foil W-400 for silver in sputtering, after that, complete spreading desiccation of the acrylic resin coating was carried out, the 1.5-micrometer-thick corrosion prevention layer was formed on it, and the diffuse reflection film of this invention was obtained.

\* 5-micrometer [ in thickness ] complete spreading desiccation of the coating liquid which scoured titanium oxide to \* actual example 4 acrylic resin coating is carried out, An 80-nm-thick metal deposition layer is formed in coating and the opposite side of a 55-micrometer-thick polyethylene terephthalate film which made total light transmittance 20% for silver with vacuum deposition, After that, complete spreading desiccation of the melamine epoxy resin coating was carried out, the 1.5-micrometer-thick corrosion prevention layer was formed on it, and the diffuse reflection film of this invention was obtained. .

[0013]\* The diffuse reflection film of the polyethylene terephthalate film (Toray Industries make trade name: lumiler X-42) former with a thickness of 100 micrometers which scoured \* comparative example 1 silicon oxide, and made lump total light transmittance 46% was obtained. .

\* The diffuse reflection film of the polyethylene terephthalate film (Teijin make trade name: Teijin Tetron film U2) former with a thickness of 50 micrometers which scoured \* comparative example titanium dioxide and made lump total light transmittance 23% was obtained.

[0014]\* The diffuse reflection film of the polyethylene terephthalate film (product [ made from diamond foil ] trade name: diamond foil W-400) former with a thickness of 38 micrometers which scoured \* comparative example 3 titanium oxide, and made lump total light transmittance 14% was obtained.

\* 5-micrometer [ in thickness ] complete spreading desiccation of the coating liquid which scoured titanium oxide to \* comparative example 4 acrylic resin coating was carried out, and the conventional diffuse reflection film coated with the polyethylene terephthalate film with a thickness of 55 micrometers which made total light transmittance 20% was obtained.

[0015]About the film of the example and comparative example which were acquired in this way, the result investigated about diffuse reflectance, a whiteness degree, and directivity was shown in Table 1.

<Valuation method of diffuse reflectance> diffuse reflectance was measured using Shimadzu Make and spectrophotometers (UV-3100PC), and read and investigated wavelength the o'clock of 550 nm.

<Directive valuation method> directivity read and investigated the absolute reflectance (550 nm) whose incident angles are 5 degrees, 12 degrees, and 45 degrees using Shimadzu Make and spectrophotometers (UV-3100PC).

The <valuation method of whiteness degree> whiteness degree measured and investigated CIE L\* of a diffuse reflection, a\*, and b\* using Shimadzu Make and spectrophotometers (UV-3100PC).

[0016]

[Table 1]

	拡散反射率 (%)	指向性 (%)			白色度		
		5°	12°	45°	L*	a*	b*
実施例 1	97.14	3.30	4.42	3.50	97.88	-0.62	0.70
比較例 1	50.43	1.66	4.12	2.34	76.33	-0.78	-4.19
実施例 2	94.58	3.35	4.46	3.55	97.87	-0.39	0.59
比較例 2	80.22	2.16	4.17	2.45	91.78	-0.81	-3.42
実施例 3	95.11	3.36	4.58	3.40	98.08	-0.35	0.61
比較例 3	88.34	2.20	4.44	2.40	95.30	-0.62	-1.81
実施例 4	95.31	3.20	4.35	3.32	97.51	-0.24	0.55
比較例 4	82.35	1.98	4.25	2.19	92.11	-0.85	-4.14

It turns out that the thing of diffuse reflectance of an example improves compared with the thing of a comparative example from Table 1, and it excels in the paper white color by indirectivity.

[0017]

[Effect of the Invention] Contain a white pigment and total light transmittance forms a metal deposition layer in the opposite hand of the reflective use side of 50% or less of plastic film base material, By forming a corrosion prevention layer on it, practical diffuse reflectance was high and the diffuse reflection film for liquid crystal displays of the paper white color excellent in indirectivity was obtained. Although the effect of this invention was demonstrated because the total light transmittance of a plastic film base material makes it to 50% or less, it is 15% or less more preferably, and it turned out that there is an effect of a metal deposition layer also unexpectedly in the case of the total light transmittance (what is depended on the measuring method in this invention) of 0%.

[Translation done.]